

Biometrics Based Bus Ticketing System

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Abstract: -- Over the last few decades, there has been an increase in the use of public transport. This increase in the use of public transport has made the ticket vending and managing the public in a bus, a very complex task. This increase has also increased the paper usage by a large quantity. To overcome this complex task, we have come up with the solution of using the fingerprint of the user to book the tickets upon boarding the bus. This system is highly secured as forgery cannot be made with respect to biometrics. The fingerprints of the user are stored in a database. Upon the time of boarding and exiting the bus, the fingerprint of the user is scanned. The odometer reading of the bus is then stored against the value of the scanned fingerprint during both the time of boarding and exiting the bus. The distance traveled by the user is then calculated and the corresponding amount of money is deducted automatically from the PTS wallet. The user is also subjected via the IR transmitter and receiver led's after their fingerprint being scanned, so as to not make the user board and exit the bus via different gates and also to not get cheated by the user. Those people whose hand gets most used due to their work and the children of age below 15 will be provided with smartcards that can be used in place of fingerprints. The fingerprints that fail to get read by the system due to some reasons for more than two(2) attempts, the smartcard may be used. This proposed idea will also have another additional feature that if a passenger stands as an obstacle to the IR led's that are placed both at the entry and exit points, a buzzer rings inside the bus until the obstacle is removed. Thus, this project brings in cent percent accuracy with respect to the amount of money deducted and also the process is completely automated. There will be a large downfall in the usage of paper and the process of public management becomes simpler. There is also a reduction in the accidents that are caused by the footboard travel with the help of the buzzer.

Keywords—Biometrics, PTS(Public Transportation System), IR led's, odometer, buzzer, fingerprints, database.

I. INTRODUCTION

Many of us people use the public transport these days. There are many problems that are being faced by the general public in terms of being managed in the over crowded bus. Another problem that the nation faces will be the paper based ticketing system that is being followed in our nation. There is also a problem of getting the exact change in a bus. There is also a possibility of our tickets being lost and paying a huge fine for the loss of a ticket is also a tedious task. The problem with the current scenario of using the RFID smart cards also has a disadvantage. Thus having considered all the problems being faced by the passengers, this idea of smart bus ticketing system using fingerprint is being proposed. Thus, this proposed system of smart ticketing using fingerprints instead of the traditional paper ticketing and the current trend of RFID system has a lot of advantages in it. This product also has an additional smartcard slot for those people working in construction sites and those people who tend to use their hands the most. The smartcard slot can also be used by students and children of age below the age of 15 as the fingerprints of those children tend to change with their age increasing. This product will be of great help to the government and mother nature of reducing the usage of paper in a large extent. This proposed idea will be of great help to the passengers also as they don't have to wait in a crowd to buy a ticket and there is no necessity for the passengers to

carry any money or cards with them as the money is automatically deducted from their personal wallets. The government may also be benefitted as the rate of ticketless passengers will come down to a great extent. The proposed idea also has an additional feature that if any of the passengers stay in the footboard as an obstacle to the IR led's, a buzzer will ring in the bus unless the obstacle comes out (i.e) the passenger comes inside the bus from the footboard. This process will reduce the footboard travel and the accidents that occur due to footboard travel will also be reduced to a great extent.

II. HARDWARE COMPONENTS

The proposed idea consists of a variety of hardware components. The hardware components include the aurduno boards, the microprocessor chip that is used in the aurduno boards, the fingerprint scanner, the buzzer, the IR transmitter and receiver, etc. The components are being explained below.

A. RASPBERRY PI:

The RASPBERRY PI boards are used since it has a large number of digital port pins when compared to the aurduno boards. The inbuilt memory of raspberry pi boards are also large. These boards also have an advantage of having an external memory. This board has the architecture of ARMv8 and microarchitecture of ARM cortexA-53. Thus with a lots of advantages in the board for the industrial automation,

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these boards can be used in a large number of ways. The features of the board are as follows:

- Uses ARMv8 architecture.
- Uses Broadcom BCM2837 SoC.
- 1.2 GHz quadcore ARM cortex A-53 CPU.
- 1GB internal memory(SDRAM).
- 15-pin MIPI computer interface video input connector.
- HDMI(rev 1.3), composite jack, MIPI display video outputs.
- MicroSDHC slot, USB Boot Mode.
- 10/100 Mbits Ethernet, 802.11n wireless, Bluetooth 4.1 .
- 17x General Purpose Input Output.

B. FINGERPRINT SCANNER

The fingerprint scanner is used to scan the fingerprint of the user and check the scanned fingerprint with the database. The fingerprints of the user are uploaded in the database before we start to use the system. The fingerprints sensor also detects the wrong or unknown fingerprints and debars the user from entering the bus with the help of the IR led's. The fingerprint scanner that is being used is the Ultrasonic fingerprint scanner. This ultrasonic fingerprint scanner is more reliable and has better features than the capacitive and optical fingerprint scanners. This ultrasonic fingerprint scanner is made up of a transmitter and a receiver. This transmitter transmits an ultrasonic pulse over the finger that is placed over the scanner. This ultrasonic pulse passes through the epidermis layer of the skin, and returns through the dermis layer. Some of this pulse gets absorbed by the skin and the remaining pulses are returned based on the ridges and pores. Thus this ultrasonic fingerprint scanner produces a very in-depth image 3D image of the fingerprint with lot more details on the ridges and pores.

C. IR LED:

The IR led are placed at the entrance and at the exit upon the scanning of the fingerprint. This IR led are used for the security purpose so that there will be no forgery in entering the bus. If the led's detect a fault (i.e), if the person enters or exits the door bypassing the fingerprints, the IR led's triggers a buzzer placed inside the bus. Thus this helps in the security purpose of the tickets scanned through fingerprints.

D.SMARTCARDS:

The smartcards are used for those people whose hands may be dirty, that may not be detected by the fingerprint scanner. These smartcards may also be used by small children below

the age of 15 years as those children don't have a fingerprint that will be worthy off scanning and their fingerprint are subjected to very minute changes. The smartcards may also be used by old people whose fingerprint are difficult to be read by the scanner. These smartcards are used as an additional feature for the fingerprint scanner. These smartcards are embedded with RFID tags. These RFID tags contain the personal information of the user and once these RFID tags are scanned, the details of the user are scanned by the reader and thus paving the way for the user inside the bus. Thus providing the people with the additional feature of the smartcards, provides more efficient and more time saving entry to the bus.

E. SMARTCARD READERS:

The smartcard readers are used to read the information of the smartcards that are scanned at the entry and exit of the passenger from the bus. The smartcard scanners are the same as the RFID tag scanners. The proposed system uses the passive type RFID scanners. This type of passive scanner powers the RFID tags with electromagnetic energy that are emitted by the reader. The access of the tags is given when the particular tag is charged by the electromagnetic energy that is emitted by the passive RFID reader. The frequency of electromagnetic energy that will be emitted by the reader is 13.56MHz. The detecting range of RFID tags will be around 10 – 100 cm.

F. GSM SIM 900A:

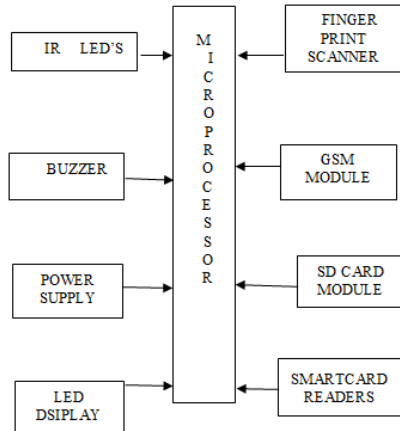
GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls and internet ect through simple AT commands.

III. BLOCK DIAGRAM:

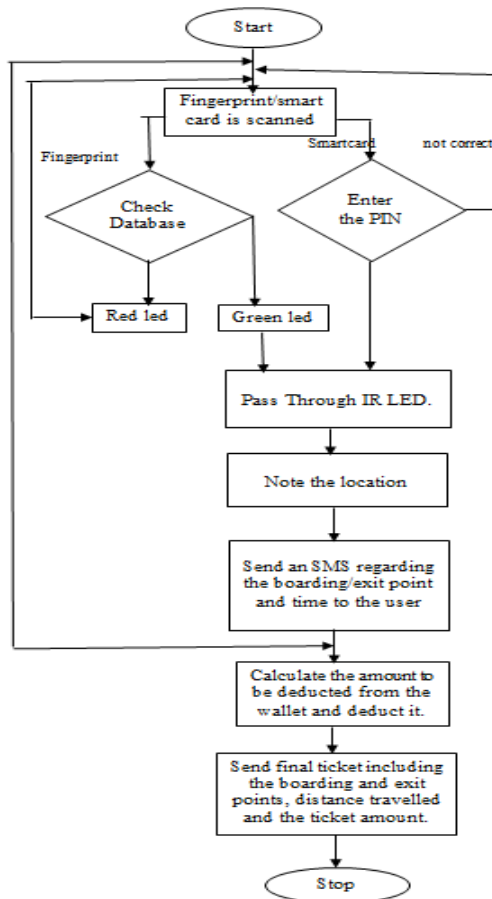
The following is the block diagram of the above proposed paper. This block diagram indicates the components used and the components that are going to be placed in the system for

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the effective working of the system.



IV. FLOWCHART



V. WORKING:

Firstly, all the details of the user are registered in a database that will be maintained by the officials. The fingerprints of all ten fingers of the user are collected thus enabling the user to use any of the fingerprints anywhere. All the details are registered against the fingerprint and the smartcard. Thus, the fingerprint and smartcard can be used anywhere and anytime. There are 2 doors in a bus. We assume one door to be used for entry and the other door for exit. When a passenger enters a bus, he is supposed to have his fingerprint scanned. This scanned fingerprint is then encrypted using a code. This encrypted code is checked with the database of such codes present in the system. If the encrypted code matches, a green color led glows beneath the screen where the fingerprint is scanned, else a red color glows in the same place as that of the previously mentioned led. If the green led glows, the passenger is allowed to proceed further through the IR Transmitter and receiver. The IR led's work such that, for every 1 fingerprint scanned only one person can pass through it. In the same manner a passenger cannot enter the bus from the exit door and vice versa. If so the above condition happens, a buzzer will buzz indicating the wrong route followed. Now, what happens is that, after the fingerprint is scanned and verified with the database, the odometer reading of the bus is noted against the fingerprint that was scanned. The same procedure is followed during the exit of the bus too. That is, the passenger's fingerprint is scanned, verified with the database, then he is allowed to pass through the IR led's. At this place too, only one person can pass through the IR transmitter and receiver. If more than one person passes through it, the buzzer will buzz indicating an extra passenger had passed through it. Thus at the exit also the odometer reading is noted by the system against the scanned fingerprint. Thus, both the odometer reading noted by the system is then subtracted. This subtracted value gives the distance the passenger has travelled by bus. Thus, the amount corresponding to the distance travelled by the passenger is deducted from a dedicated e-wallet that is being used especially for PTS(Public Transport System). The smartcards are used instead of the fingerprints in cases where the fingerprint scanning is not possible. The same procedure is followed with the smartcards with an addition of entering a 3 - digit PIN number prior to entering the bus just to verify that the smartcards is being used by the authorized person only. Upon, entry and exit of the bus by a passenger an SMS is being sent to the registered mobile number of the passenger indicating

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the bus number, entry stop, entry time, exit stop and exit time. The final ticket will also be sent as an SMS and as an E-Mail to the respective mobile numbers and e-mail id. Thus the system of ticket collection in a bus completely becomes automated. This system also reduces corruption of ticketless travel and it also completely stops the practice of using paper tickets thereby, saving a lot of paper being used.

VI. CONCLUSION:

Thus the above concept can be implemented in the public transportation system. This project upon implementation can reduce the amount of paper used in the process of ticketing and can develop a complete automated system of ticketing in a bus. This system will also be helpful to track the travelling details of the passengers in case of necessary.

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